

that "Applicant's Amendment necessitated the new ground(s) of rejection presented in the Office action." No grounds existed, however, for making this action final.

The Examiner appears to cite form paragraph 7.40 in making this action final. That form paragraph, however, is cited in the MPEP under the section defining when a final rejection is proper on a *second* action. MPEP 706.07(a). The MPEP section that governs when a final rejection is proper on the *first* action sets forth different bases for making first actions final -- the fact that an applicant's amendment necessitated new grounds of rejection is not among those bases.

Instead, a first action is properly made final where (1) the new application is a continuing application of, or a substitute for, an earlier application, and (2) all claims of the new application (a) are drawn to the same invention claimed in the earlier application, and (b) would have been properly finally rejected on the grounds and art of record in the next Office action if they had been entered in the earlier application. MPEP 706.07(b). Since claims 24-45 under examination in this CPA were newly entered in the Preliminary Amendment filed April 13, 1998 and are subject to new grounds of rejection, the criteria set out in MPEP 706.07(b) were not met. Therefore, the finality of this Office Action should be withdrawn and examination should proceed with the understanding that this response is made to a nonfinal Office Action.

## **II. Objection to Claim Dependency**

Claims 3-6 and 10-13 are objected to as being dependent on canceled claims. Claims 3-6 and 10-13 are canceled by the above amendment and, therefore, this objection should be withdrawn.

### **III. Rejection Based on 35 U.S.C. § 112, first paragraph**

Claims 3-6, 10-13 and 24-45 are rejected under 35 U.S.C. § 112, first paragraph, as lacking enablement. In making this rejection, the Examiner states that the specification is enabling for a method of parenteral administration of IGF-I, IGF-II, or a combination of both IGF-I and II for the treatment of locus ceruleus noradrenergic neurons ablation by 6-hydroxydopamine. The Examiner asserts, however, that the specification does not reasonably provide the full scope of enablement for parenteral administration of IGF-I or IGF-II for traumatic injury of the central nervous system (CNS) or spinal cord and treating stroke. The Examiner also asserts that the specification fails to make a nexus from the model of using IGF-I and II for the treatment of locus ceruleus noradrenergic neurons ablation by 6-hydroxydopamine to treating stroke or traumatic injury to the CNS or the brain. Applicant traverses this rejection.

Applicant contends that the specification enables the pending claims. There is a genuine nexus between the enabling teachings in the specification and the claimed treatment methods. Applicant's specification disclosed that the central nervous system could be treated by nonintracranial parenteral administration of IGFs. As set out in the Background of the Invention, other research groups had contemplated various procedures to circumvent the blood brain barrier to treat diseases and disorders in the brain. These treatments included techniques such as drilling holes through the skull (a highly invasive, costly and risky surgical procedure) or constructing chimeric peptides of an IGF and a transportable peptide. Applicant discovered that the less invasive parenteral administration of IGFs could be employed to effectively treat the central nervous system, without the need, for example, to break through the skull or blood-brain barrier or to develop IGF-chimeras having enhanced transport properties.

Examples were then provided in the specification to demonstrate that nonintracranial administration of IGFs provides effective treatment of the central nervous system in a rat model. As further described in the Declaration of Douglas Ishii, (i) Example III of the specification and additional experiments described in the Declaration demonstrate that chemically-induced damage to the locus ceruleus can be ameliorated by parenteral administration of IGFs -- this model predictably correlates with treatment of diseases and disorders of the central nervous system; (ii) many scientific publications of other research groups confirm the specification's identification of the locus ceruleus as a region in the central nervous system that is affected by neurodegenerative trauma and disorders; and (iii) experiments set forth in the Declaration confirm that parenterally-administered IGFs crosses the blood brain barrier and can be detected in cerebral spinal fluid. The Examiner is respectfully directed to the Declaration for further explanation of these points.

Therefore, applicant requests withdrawal of the rejection under 35 U.S.C. § 112, first paragraph.

#### **IV. Rejection under 35 U.S.C. § 102(e)**

Claims 3-10, 10-13 and 24-45 are rejected under 35 U.S.C. § 102(e) as being anticipated by Lewis et al. (U.S. Patent No. 5,093,317). Applicant traverses this rejection.

The Examiner states that Lewis et al. teach the method of treating injury and stroke (col. 4, lines 1-22). The Examiner then acknowledges applicant's position that Lewis et al. does not teach IGF acting across the blood-brain barrier but rather teaches away by characterizing the blood brain barrier as a problem. Nevertheless, the Examiner asserts that Lewis et al. teach the method of parenteral administration of IGF-I or IGF-II with specific dosage ranges of 1 ug/kg/day to 1 g/kg/day. The Examiner also asserts that IGF I and II inherently cross the blood

brain barrier. The Examiner then concludes that “[t]hus, the prophetic contemplation of potential problems does not exclude the teachings of Lewis.”

Applicant wholeheartedly disagrees with the Examiner’s allegation that “the prophetic contemplation of potential problems does not exclude the teachings of Lewis et al.” Statements in the specification of Lewis et al. that characterize the blood-brain barrier as an obstacle to effective treatment of the central nervous system cannot be ignored by the Examiner:

Where the polypeptide is intended for use as a therapeutic for disorders of the CNS, an additional problem must be addressed: overcoming the so-called “blood-brain barrier,” the brain capillary wall structure that effectively screens out all but selected categories of molecules present in the blood, preventing their passage into the brain. While the blood-brain barrier may be effectively bypassed by direct infusion of the polypeptide into the brain, the search for a more practical method has focused on enhancing transport of the polypeptide of interest across the blood-brain barrier, such as by making the polypeptide more lipophilic, by conjugating the polypeptide of interest to a molecule which is naturally transported across the barrier, or by reducing the overall length of the polypeptide chain.

Lewis et al., col. 3, ll. 44-58.

Applicant specifically pointed to this passage of Lewis et al. to show that Lewis is teaching away from a key aspect of applicant’s invention. “Teaching away” from the claimed invention is probative of the obviousness issue. A prior art reference may be considered to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. *Monarch Knitting Mach. v. Sulzer Morat GMBH*, 139 F.3d 877, 885 (Fed. Cir. 1998); *Dow Chem. Co. v. American Cyanamid Co.*, 816 F.2d 617, 622-23 (Fed. Cir. 1987)(finding that a reference teaching that copper alone was not an effective catalyst taught away from the claimed invention’s use of copper metal as a catalyst).

One of ordinary skill in the art would see the statements in Lewis characterizing the blood-brain barrier as an obstacle to treating the central nervous system with IGFs and would be discouraged from administering IGFs without the sort of aids proposed by Lewis. Even Lewis et al. had to resort to administering the IGFs through a hole in the skull in testing live subjects. A careful study of the examples reveals that Lewis et al. could only test the effect of IGFs on the brain by *in vitro* studies on brain tissue dissected from rats (Examples 1, 2); *in vitro* studies on spinal cord neurons dissected from 14-day old embryonic rat (Example 3); intracerebral injection through the blood brain barrier directly into the brain of rats (Example 4 and 5); *in vitro* studies on isolated bovine brain microvessels (Example 6); prophetic examples that did not involve any tissue testing (Examples 7-10) and *in vitro* tests on microvessel endothelial cells isolated from the cerebral gray matter of fresh bovine brains (Example 11). Not a single example involves the *in vivo* parenteral, nonintracranial administration of an IGF. Therefore, Lewis et al. is not a proper basis for rejecting applicant's claims as obvious.

In view of the above, applicant requests withdrawal of the rejection under 35 U.S.C. § 103 based on Lewis et al.

#### **V. Conclusion**

In view of the above Amendment and Remarks, Applicant believes that this case is in condition for allowance. The Examiner is invited to contact the undersigned attorney at (713) 787-1686 with any comments relating to this application.

If any fees are required, the Assistant Commissioner is authorized to deduct those fees from Arnold, White & Durkee Deposit Account No. 01-2508/CSUA019--1WAA.

Respectfully submitted,



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November 2, 1998

Monarch Knitting Machinery Corp. v. Sulzer Morat GmbH (CA FC) 45 USPQ2d 1977 (3/10/1998)

**Monarch Knitting Machinery Corp. v. Sulzer Morat GmbH (CA FC) 45 USPQ2d 1977 (3/10/1998)**

**Monarch Knitting Machinery Corp. v. Sulzer Morat GmbH**

**U.S. Court of Appeals Federal Circuit CA FC  
45 USPQ2d 1977  
3/10/1998**

**Decided March 10, 1998  
No. 97-1224**

**Monarch Knitting Machinery Corp. v. Sulzer Morat GmbH (CA FC) 45 USPQ2d 1977 (3/10/1998)**

**Headnotes**

**Monarch Knitting Machinery Corp. v. Sulzer Morat GmbH (CA FC) 45 USPQ2d 1977 (3/10/1998) \ Headnotes**

**PATENTS**

**1. Patentability/Validity -- Obviousness -- Relevant prior art -- In general (§ 115.0903.01)**

Federal district court's formulation of problem confronting inventors of needles for

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automatic knitting machine presumes their solution to problem, namely modification of "stem segment"

of needles; defining problem in terms of its solution reveals improper hindsight in selection of prior art relevant to obviousness, resulted in district court adopting overly narrow view of scope of prior art, and infected district court's determinations about content of prior art.

**2. Patentability/Validity -- Obviousness -- Relevant prior art -- In general (§ 115.0903.01)**

**Patentability/Validity -- Obviousness -- Combining references (§ 115.0905)**

Although "trend" may constitute suggestion or teaching to one of ordinary skill in art to make "minor" changes from prior art in accordance with that trend to produce claimed invention, existence of trend depends on content of prior art, and trial court may not proceed to find trend without first determining whether prior art contains suggestion or motivation to combine references to form such trend.

**3. Patentability/Validity -- Obviousness -- Combining references (§ 115.0905)**

Genuine issue exists as to whether those of ordinary skill in art would have had motivation to combine prior art references to form "trend" toward use of increasingly lower "stem segment" heights for automatic knitting machine needles in attempt to prevent high-speed breakage, since prior art includes many references, all of which state problem addressed as preventing breakage of hook portion of needles at high speed, and each of which proposes different solution; after properly ascertaining scope of prior art, further genuine issue of fact remains as to whether trend toward decreasing stem segment heights even existed in prior art.

**4. Patentability/Validity -- Obviousness -- Long felt need (§ 115.0909)**

Genuine issue of fact exists as to whether contemporaneous independent development of two automatic knitting machine needles, similar to those claimed in patent in suit, solved long-felt need in art for needle that would not break during high speed operation, since evidence justifies reasonable inference that designer of claimed needle did not recognize benefit of that design, and it is unlikely that particular solution solves long-felt need if its developer does not recognize that it does so, since there is evidence that one of two needles in question was never produced, and that second was not produced until after patent's priority filing date, and since these facts, if proven, raise reasonable inference that two designs were isolated and failed to satisfy long-felt need that existed at large.

**5. Patentability/Validity -- Obviousness -- Secondary considerations generally (§ 115.0907)**

Genuine issue exists as to whether automatic knitting machine needles of patent in suit produced unexpected results, since there is evidence that use of patented needles allowed machine speeds to increase as much as 40 percent, which was increase larger in magnitude than any previously attained, and that use of such needles eliminated needle hook breakage as major limit on knitting machine speeds,

since both of these results, if proven, could support inference of unexpected results, and since there is also evidence that some persons of ordinary skill in art were skeptical of advantages of patented needle design.

**6. Patentability/Validity -- Obviousness -- Secondary considerations generally (§ 115.0907)**

Genuine issue exists as to whether prior art taught away from design of automatic knitting machine needles claimed in patent in suit, since record includes prior patent that teaches away from use of needle incorporating "cutout" taught by patent in suit, as well as evidence that those skilled in art, rather than viewing use of cutouts as solution to problem of needle hook breakage, believed such cutouts would lead to increased hook breakage.

**Particular patents -- General and mechanical -- Needles for knitting machines**

4,452,053, Egbers, Schuler, Seidel, and Buhler, stamped knitting-tool for knitting machines, summary judgment of invalidity vacated.

**Monarch Knitting Machinery Corp. v. Sulzer Morat GmbH (CA FC) 45 USPQ2d 1977 (3/10/1998)**

**Case History and Disposition:**

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Appeal from the U.S. District Court for the Southern District of New York, Sand, S.J.

Action by Monarch Knitting Machinery Corp. against Sulzer Morat GmbH for declaratory judgment of patent invalidity, consolidated with action by Theodor Groz & Sohne and Ernst Beckert Nadelfabrik Commandit-Gesellschaft against plaintiff for patent infringement, in which declaratory plaintiff/infringement defendant and Fukuhara Industrial & Trading Co., Fukuhara Needle Co., Precision Fukuhara Works Ltd., and

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Monarch International Japan Ltd. counterclaim against Groz-Beckert U.S.A. Inc. From grant of summary judgment holding claims 1-5, 7-11, 13 and 15 of patent in suit invalid for obviousness, Sulzer Morat GmbH, Theodor Groz & Sohne and Ernst Beckert Nadelfabrik Commandit-Gesellschaft, and Groz-Beckert U.S.A. Inc. appeal. Vacated and remanded.

**Attorneys:**

Nicholas L. Coch, George P. Hoare Jr., and Richard B. LeBlanc, of Rogers and Wells, New York, N.Y., for declaratory judgement defendant appellant, plaintiff-appellant, and counterclaim defendant-appellant.

John J. Barnhardt III, Paul B. Bell, and Michael S. Connor, of Bell, Seltzer, Park & Gibson, Charlotte, N.C.; Frederick Newman, of Salomon, Gruber, Newman, Blaymore & Rothschild, Roslyn Heights, N.Y., for declaratory judgment plaintiff/counterclaim plaintiffs-appellees.

**Judge:**

Before Mayer, chief judge, \* and Lourie and Rader, circuit judges.

**Opinion Text**

**Opinion By:**

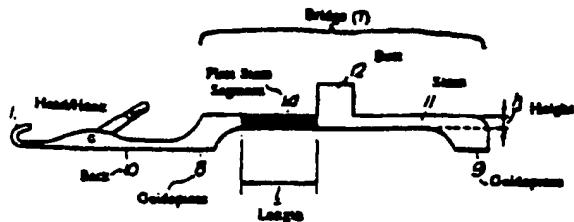
Rader, J.

**Monarch Knitting Machinery Corp. v. Sulzer Morat GmbH (CA FC) 45 USPQ2d 1977  
(3/10/1998) \ Opinion Text**

On summary judgment, the United States District Court for the Southern District of New York declared claims 1-5, 7-11, 13, and 15 of U.S. Patent No. 4,452,053 (the '053 patent) invalid for obviousness. Because the trial court improperly resolved genuine issues of material fact, this court vacates the judgment and remands for further proceedings.

I.

The '053 patent covers thin metal needles for machines that automatically knit yarn into fabric. The knitting machine industry refers to the '053 needles as "low-profile" needles. A figure from the '053 patent, reproduced below, shows a "low-profile" needle. The labels accompanying the figure denote various portions of the needle.



As illustrated, a low-profile needle has a "head" that is bent like a hook, a shaft (or shank) that has at least one "bridge" (the bridge is a "stem" supported by two or more "guidepieces" that extend to the "back" of the needle), and at least one "butt" attached to the shaft in the region of the bridge. The portion of the stem that runs parallel to the needle back is called a "segment." The "first segment" lies between the head and the butt.

Depending on its size, a knitting machine requires up to 4000 or more needles. Each needle rests with its back against the bottom of a groove. A cam strikes and releases the butt to move the needle forward and back within the groove. This reciprocating needle motion within the groove accomplishes the knitting.

To optimize output, fabric manufacturers, of course, wish to run the machine as fast as possible. The major limit on the speed of automated knitting machines, however, has been the tendency of needle hooks to break. Even a single broken needle leaves a long disfiguring line in the knitted fabric. To avoid the downtime required to replace a broken needle, machine owners often must run the machines at slower speeds in order to minimize needle breakage.

In 1976, one of the appellants, Sulzer Morat GmbH (Sulzer Morat), commissioned a study to determine the causes of hook breakage. The researchers observed the effects of various design changes on the vibration of knitting needles. For example, when the cam's surface strikes the butt of a needle, it causes shock waves and vibrations in the needle. After using high-speed photography to observe the vibrations, the researchers determined that a smaller first segment height produced superior results. Sulzer Morat filed a German patent application on May 12, 1978, and a U.S. patent application on May 11, 1979, claiming priority from the filing date of the German application. The '053 patent issued on June 5, 1984.

The only independent claim of the '053 patent, claim 1, states:

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A stamped knitting-tool which can be employed in knitting machines and has a head bent like a hook, a shaft having at least one bridge which consists of two guidepieces extending as far as the back of the knitting-needle and a stem arranged above the back to bridge across the guidepieces, and at least one butt coupled to the shaft in the region of the bridge, where the stem includes at least one first segment arranged between the head and the butt, said tool including means for controlling vibration within the needle and preventing tool breakage at increasing knitting speeds, said means including the shape of said needle which has said first segment . . . having a length (*l*) of at least eight millimeters (8 mm) and a height (*h*) of at most eleven tenths of a millimeter (1.1 mm).

(emphasis added). During the prosecution of the '053 patent, the examiner rejected claim 1 as obvious in view of U.S. Patent No. 3,464,237, issued to Kohorn in 1969. The Kohorn '237 patent taught the use of cutouts at the back of the needle to reduce vibration, "thereby substantially lowering the frequency of needle breakage" and increasing the speed of knitting machines "by twenty percent." Kohorn '237 patent, col. 2, lines 5-12. Kohorn taught that the cutouts should extend approximately one-half the distance from the back of the needle towards the front. The examiner reasoned that one of ordinary skill in this art, knowing of solid shank needles with a shank height of 2.2 mm and applying the teachings of the Kohorn '237 patent, would create a needle with the dimensions of claim 1. In response, Sulzer Morat pointed out that no known prior art needles had a shank height of less than 2.85 mm, let alone 2.2 mm. The examiner allowed the application, and the '053 patent issued. Sulzer Morat was the initial assignee.

In 1985, Monarch Knitting Machinery Corp. (Monarch) filed a declaratory judgment action against Sulzer Morat in the United States District Court for the Southern District of New York. Monarch

asserted, *inter alia*, that the '053 patent was invalid for obviousness. Shortly thereafter, the district court stayed the proceedings pending a reexamination by the Patent and Trademark Office (PTO) in light of newly discovered prior art.

The new prior art was a Japanese publication that disclosed two needles with shank heights of 1.92 mm and 2.0 mm. Once again, the examiner rejected the '053 patent in view of the Kohorn '237 patent, this time in combination with the Japanese publication. On appeal, the Board of Patent Appeals and Interferences concluded that the examiner had not shown a *prima facie* case of obviousness, because the needles disclosed in the Japanese publication had first segment *lengths* of less than 8 mm. A reexamination certificate confirming all of the original claims issued on November 13, 1990.

Meanwhile, Sulzer Morat had assigned all of its rights in the '053 patent to Theodor Groz & Sohne and Ernst Beckert Nadelfabrik Commandit-Gesellshaft (Groz-Beckert). After the reexamination, Groz-Beckert commenced an infringement action against Monarch and its suppliers. The district court consolidated the two actions.

On September 7, 1994, Monarch filed a motion seeking summary judgment that all claims of the '053 patent were invalid for obviousness. The district court granted the motion as to claim 1, but concluded that the record did not contain sufficient evidence to rule on the other claims. On April 19, 1996, Monarch filed a similar summary judgment motion for claims 2-5, 7-11, 13, and 15 on a supplemented record. The district court granted the motion and entered final judgment on the declaratory judgment claim for invalidity under Fed. R. Civ. P. 54(b). This appeal followed.

This court concludes that genuine issues of material fact remain. Although Groz-Beckert later supplemented the record with additional evidence of objective indicia of nonobviousness, this evidence was not before the trial court for the first motion for summary judgment. Except as otherwise stated, this court relies only on the evidence available to the district court when it entered summary judgment on claim 1. Thus, this court's conclusion necessarily follows for all the claims at issue, regardless of the fact that the district court invalidated all other claims in a second motion on a supplemented record.

## II.

This court reviews a district court's grant of summary judgment *de novo* by reapplying the standard applicable at the district court. *See Conroy v. Reebok Int'l*, Ltd., 14 F.3d 1570, 1575, 29 USPQ2d 1373, 1377 (Fed. Cir. 1994). Summary judgment is appropriate only when "there is no genuine issue as to any material fact and . . . the moving party is entitled to a judgment as a matter of law." Fed. R. Civ. P. 56(c). In its review, this court draws all reasonable inferences in favor of the nonmovant. *See United States v. Diebold, Inc.*, 369 U.S. 654, 655 (1962). Moreover, in rendering a decision on a motion for summary judgment, a court must "view the

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evidence presented through the prism of the substantive evidentiary burden" that would inhere at trial. *See Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 254 (1986). The moving party "bears the burden of demonstrating the absence of genuine issues of material fact." *Conroy*, 14 F.3d at 1575.

In this case, the district court rendered summary judgment on the question of obviousness. Obviousness is ultimately a determination of law based on underlying determinations of fact. *See*

*Richardson-Vicks Inc. v. Upjohn Co.*, 122 F.3d 1476, 1479, 44 USPQ2d 1181, 1183 (Fed. Cir. 1997). These underlying factual determinations include: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) the extent of any proffered objective indicia of nonobviousness. See *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 [ 148 USPQ 459 ] (1966). Thus, to review a summary judgment of obviousness, this court first determines anew whether the record raises any genuine issues about these critical facts. In doing so, this court remains cognizant of the statutory presumption of validity, see 35 U.S.C. Section 282 (1994), and of the movant's burden to show invalidity of an issued patent by clear and convincing evidence, see *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 716, 21 USPQ2d 1053, 1055 (Fed. Cir. 1991). If facts remain in dispute, this court weighs the materiality of the dispute, i.e., whether resolution of the dispute one way or the other makes a difference to the final determination of obviousness.

Given the occasional use of archaic terminology in the district court's opinion, this court also emphasizes that the standard for patentability is the statutory standard. The inquiry is not whether there was a "real discovery of merit" or whether the claimed invention offered a "new solution," but whether the claimed subject matter as a whole "would have been obvious at the time the invention was made to a person having ordinary skill in the art." 35 U.S.C. Section 103(a) (Supp. I 1995).

### III.

[1] To ascertain the scope of the prior art, a court examines "the field of the inventor's endeavor," *Shatterproof Glass Corp. v. Libbey-Owens Ford Co.*, 758 F.2d 613, 620, 225 USPQ 634, 638 (Fed. Cir. 1985), and "the particular problem with which the inventor was involved," *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1535, 218 USPQ 871, 876 (Fed. Cir. 1983) (quoting *In re Wood*, 599 F.2d 1032, 1036, 202 USPQ 171, 174 (CCPA 1979)), at the "time the invention was made," see 35 U.S.C. Section 103(a). The district court defined the problem as "designing the *stem segment* of a knitting needle . . . [to] minimize [ ] needle head breakage and thus maximize [ ] the operating speed of an industrial knitting machine." (emphasis added). The '053 patent, on the other hand, describes the inventor's problem as "providing [knitting needles] with a means which avoids head breakages or lets [breakages] start to an extent worth mentioning only at higher knitting speeds." '053 patent, col. 1, lines 48-51. The district court's formulation of the problem confronting the '053 inventors presumes the solution to the problem -- modification of the stem segment. Defining the problem in terms of its solution reveals improper hindsight in the selection of the prior art relevant to obviousness. See, e.g., *In re Antle*, 444 F.2d 1168, 1171-72, 170 USPQ 285, 287-88 (CCPA 1971) (warning against selection of prior art with hindsight). By importing the ultimate solution into the problem facing the inventor, the district court adopted an overly narrow view of the scope of the prior art. It also infected the district court's determinations about the content of the prior art.

[2] The district court based its conclusion of obviousness heavily on its determination that the prior art showed a "trend" towards increasingly lower stem segment heights. A "trend" might very well constitute a suggestion or teaching to one of ordinary skill in the art to make "minor" changes from the prior art in accordance with that trend to produce the claimed invention. Cf. *In re Chu*, 66 F.3d 292, 298, 36 USPQ2d 1089, 1094 (Fed. Cir. 1995) (stating that even when changes from the prior art are "minor" or "simple," an inquiry must be made as to whether "the prior art provides any teaching or suggestion to one of ordinary skill in the art to make the changes" (quoting *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 935, 15 USPQ2d 1321, 1324 (Fed. Cir. 1990))). Whether the prior art discloses a "trend" is a question of fact. The existence of a trend depends on the content of the prior art,

i.e., what the prior art would have taught one of ordinary skill in this art at the time of this invention.

The district court identified four prior art needles as establishing the "trend." All four needles were made by Groz-Beckert: The first was made in 1965 and included "some cutouts" in the shank. The second was made in 1967 and had a cutout that produced a segment height of 1.7 mm. In 1972, Groz-Beckert

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made the third needle with a segment height of 1.6 mm, and in 1973, it made the "meander needle" with a segment height of 1.4 mm. The district court reasoned that the differences between the '053 needle and the fourth needle in the district court's series -- the meander needle -- was only one of degree.

Before the trial court, however, may examine the existence of a trend towards decreasing first segment heights among those needles with a first segment configuration, it must resolve an antecedent question. By defining the inventor's problem in terms of its solution, the district court missed this necessary antecedent question, namely, whether the prior art contains a suggestion or motivation to combine references *to form a trend*. See *Carella v. Starlight Archery*, 804 F.2d 135, 140, 231 USPQ 644, 647 (Fed. Cir. 1986) ("Obviousness cannot be established by combining the teachings of the prior art . . . absent some teaching, suggestion or incentive supporting the combination."); *Orthopedic Equip. Co. v. United States*, 702 F.2d 1005, 1012, 217 USPQ 193, 199 (Fed. Cir. 1983) ("It is wrong to use the patent in suit as a guide through the maze of prior art references, combining the right references in the right way so as to achieve [a desired result]."). Stated otherwise, what would have impelled one of ordinary skill to recognize a relationship between stem segment height and the hook breakage problem? If those of ordinary skill would have recognized a relationship, then, and only then, does the trial court proceed to examine whether the prior art in fact contains a coherent teaching about that relationship. Thus, before proceeding to find a trend, the trial court must discern whether one of ordinary skill would have had a motivation to combine references to form a trend.

[3] In this regard, the Kohorn '237 patent contains a suggestion to use "cutouts" as a solution to the hook breakage problem. On the other hand, the record also contains evidence suggesting that one of ordinary skill would not have had a motivation to combine references to form a trend. Instead, those of skill in the art were experimenting with many different methods for reducing hook breakage. For example, the record shows that in 1966, the problem of hook breakage at high speeds was recognized in a German patent. It ascribed this problem to shock waves propagating from the butt to the hook. The patent's proposed solution was to dampen these shock waves by putting several small notches at the back and front of the shaft of the needle or, alternatively, to have a portion of the needle shaft made of a different mechanical structure. Several other prior art references recognized the problem of hook breakage at high speeds, theorizing other causes and/or proposing other solutions. These solutions included forming a triangular-shaped, spring-acting portion in the shank to absorb oscillation (1971), coating the shank with shock-absorbing polymeric material (1972), forming curved, undulating portions in the shank to absorb longitudinal shock (1974), placing vertical offsets in the form of bridges in the shank (1974), using scalloped cutouts rather than rectangular cutouts (1975), and constructing the shaft of the needle out of several shock-absorbing intermediate members (1976). All of these references stated the problem as preventing hook breakage at high speeds. Each of these references proposed a different solution. Thus, this evidence creates a genuine issue as to whether those of ordinary skill would have had

a motivation to combine needles with varying stem segment heights to form a trend.

Beyond the motivation to combine question, the trial court must also determine whether the prior art forms a trend. The record contains evidence calling into question whether, even among needles employing a first segment configuration, the entire content of the prior art shows a trend towards decreasing first segment heights. The record shows that the four needles selected by the district court were made for four different knitting machines, not replacements for the same machine over time. Given this evidence, a reasonable inference can -- and on summary judgment must -- be drawn in favor of the patentee that the four examples chosen by the trial court do not show a trend. Moreover, as early as 1957, Groz-Beckert made a needle having a segment height of 1.5 mm. Because this 1957 needle "bucks the trend" perceived in the four selected by the trial court, a reasonable fact finder could conclude that the entire body of prior art does not evince a trend toward decreasing segment heights. In sum, after properly ascertaining the scope of the prior art, genuine issues of fact remain about the content of that art. Specifically, a further genuine issue of fact remains as to whether a trend toward decreasing first segment heights existed in the prior art.

#### IV.

Next this court examines the trial court's determination on the level of ordinary skill in the art. The district court properly determined that "a person of ordinary skill in the art of needle design . . . was a mechanical

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engineer with a working knowledge of knitting machinery and needle design." Neither party disputes this conclusion. In conjunction with this determination, the district court discussed two alleged instances of independent development of the same invention. Although this court has noted the relevance of contemporaneous independent invention to the level of ordinary knowledge or skill in the art, *see In re Merck & Co.*, 800 F.2d 1091, 1098, 231 USPQ 375, 380 (Fed. Cir. 1986), it has also acknowledged the view that this evidence is relevant as a secondary consideration, *see Medtronic, Inc. v. Daig Corp.*, 789 F.2d 903, 906, 229 USPQ 664, 667 (Fed. Cir. 1986). Therefore, this court will address the evidence of contemporaneous invention in that context.

#### V.

Turning to the objective criteria or the secondary considerations, this court examines first the trial court's conclusions about commercial success. The district court concluded -- and none of the parties disputes -- that the low-profile needle enjoys commercial success and that this success is *prima facie* due to the needle's differences from the prior art. The undisputed evidence shows that low-profile needles meet more than 70% of the requirements of original equipment knitting machine manufacturers. Moreover, low-profile needles command a sales price that is greater than 1.4 mm meander needles by about fifteen to thirty percent. The district court correctly determined that the record disclosed no genuine issue of fact about the existence and degree of commercial success.

The record also contains evidence of a long-felt need. However, the district court concluded that it was not an *unsolved* need because at least two companies had already designed low-profile needles before the '053 priority filing date. Because Title 35 provides for interference proceedings, it implicitly recognizes that contemporaneous independent invention may not alone show obviousness. *See*

*Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1460, 221 USPQ 481, 487 (Fed. Cir. 1984). Accordingly, this court weighs evidence of contemporaneous invention "in light of all the circumstances," *id.*, especially in light of evidence of long-felt need.

The district court cited evidence of two contemporaneous independent developments. First, the record shows that while working with Mayer & Cie, a knitting machine manufacturer, Groz-Beckert designed a knitting needle having dimensions required by claim 1. A diagram of this needle design, dated March 1, 1978, discloses a needle with a first segment height of 1.0 mm and a length of 22 mm. In addition, the record shows that Fukuhara, one of Monarch's suppliers and an appellee in this case, independently designed a similar needle. An engineering drawing dated December 8, 1976, shows a needle with a first segment height of 1.1 mm over a length of 11 mm. These needles do not qualify as "prior art" under 35 U.S.C. Section 102 or Section 103(a), but are relevant to obviousness as a secondary consideration.

To rebut this evidence, appellants argue that the 1.0 mm needle was designed by Ernst Beck, the chief of Groz-Beckert's needle design department. As such, appellants assert that he possessed extraordinary skill in the art of needle design and his labors do not aid the inquiry about obviousness to one of ordinary skill in the art. Without question, the focus for obviousness is on the level of *ordinary* skill in the art, but appellants point to no evidence other than Beck's title that he possessed extraordinary skill.

Further, appellants also argue that the uninterrupted existence of a long-felt need in the art renders immaterial any evidence of contemporaneous development. Appellants reason that a long-felt need in the art is inherently in tension with concluding that an invention is obvious on the basis of independent contemporaneous development. Once again the appellants' correct assertion sharpens the focus. The relevant secondary consideration is "*long-felt but unsolved need*," not long-felt need in isolation. The question, then, is whether this evidence of contemporaneous development solved the need. On that point, the record discloses genuine issues of material fact.

[4] For example, the record shows that Groz-Beckert had doubts about the '053 needle design, even though Groz-Beckert had already itself designed a low-profile needle. This evidence justifies a reasonable inference that Groz-Beckert did not recognize the benefit of its needle design. Assuming the accuracy of these asserted facts, it is difficult to see how a solution solves long-felt need if its developer does not recognize that it does so.

Furthermore, the parties do not dispute that the Fukuhara needle was never produced. As for the Groz-Beckert needle, it was not produced until after the '053 priority filing date. Even then, the Groz-Beckert needle was made initially only for Mayer & Cie. Because it was an entire industry that had endured the long-felt need, these facts -- if proven -- raise a reasonable inference that

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these two designs were isolated and failed to satisfy the long-felt need that existed at large. Although Monarch may ultimately prevail at trial on this issue, the district court erred in summarily concluding that the record showed no long-felt but unsolved need.

The district court did not address the existence of unexpected results. The record shows that smaller first segment heights produced less hook breakage and increases in knitting machine speeds. For

example, of the needles comprising the alleged "trend," the 1.6 mm needle permitted machine speeds to increase by 14%. The 1.4 mm needle permitted speeds to increase by 12%. The record also suggests that cutting metal away from a needle stem is "normal" and gave results that were expected "from an engineering point of view." This evidence tends to suggest that decreasing the first segment height would result in machine speed increases.

[5] Groz-Beckert does not point to any evidence of unexpected results that was before the district court on the first motion for summary judgment. However, Groz-Beckert supplemented the record with evidence of unexpected results in response to the second motion. Thus, this evidence is only applicable to the summary judgment for claims 2-5, 7-11, 13, and 15. For example, the record shows that '053 needles increased machine speeds on the average about 15-25%. Other evidence, however, shows that some machines saw improvements of up to 40%. Moreover, there is evidence that hook breakage was no longer the limiting factor to increasing knitting machine speed. Thus, although previous needles had allowed machine speeds to increase, a reasonable fact finder could conclude that the needle allowed machine speeds to increase by 40% - an increase that was larger in magnitude than any previously attained. More significantly, regardless of the actual percentage increase in machine speeds, none of the previous needles had suddenly removed hook breakage as the major limit on knitting machine speeds. Both of these results -- if proven -- could support an inference of unexpected results. The evidence that some of ordinary skill were skeptical of the advantages of the '053 needle design may also help show unexpected results. Given the possibility that the record could support these inferences, this objective criterion also remains a disputed question of fact.

A prior art reference may be considered to teach away when "a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley*, 27 F.3d 551, 553, 31 USPQ2d 1130, 1131 (Fed. Cir. 1994). General skepticism of those in the art -- not amounting to teaching away -- is also "relevant and persuasive evidence" of nonobviousness. *Gillette Co. v. S.C. Johnson & Son, Inc.*, 919 F.2d 720, 726, 16 USPQ2d 1923, 1929 (Fed. Cir. 1990). In effect, "teaching away" is a more pointed and probative form of skepticism expressed in the prior art. In any case, the presence of either of these indicia gives insight into the question of obviousness.

[6] The district court concluded that there was no genuine issue as to this consideration. This conclusion, however, discounts record evidence to the contrary. The record contains ample evidence from which a reasonable fact finder could conclude that the art taught away from decreasing segment height. For example, U.S. Patent No. 4,036,036, filed in March 1976, stated:

We must also be sure that we have not made the needle too light, which might be the case with needles which incorporate large cutouts or notches. While the ordinary engineer might think that the lighter needle with its reduced mass would always be beneficial in such a reciprocating motion mechanism, that is not always the case with knitting needles.

'036 patent, col. 2, lines 22-35.

The record also contains evidence of skepticism in the art. A sworn affidavit by Gerhard Muller, an engineer at Terrot, a knitting machine manufacturer, states: "[I]t was our common opinion that a needle should not be more 'elastic' than a meander needle with a stem height of 1.4 mm. Especially, we dreaded that such needles would stretch or lengthen. . . ."

In addition, the declaration of Groz-Beckert's expert, George Tay, stated: "I saw the flexing and bending of the needle portion and the consequent vibrating of the needle head as a phenomenon which it would be counterproductive to increase." In a puzzling passage, the district court concluded that this declaration did not raise a contested issue of fact, because it was "refuted" by an "admission" of one of the '053 inventors. However, even if there was such an "admission," the testimony of an inventor is simply strong refuting evidence, not dispositive evidence at the summary judgment stage of an obviousness proceeding.

Groz-Beckert supplemented the record with other evidence of skepticism in response to the second motion for summary judgment. Thus, this evidence is only applicable to the summary judgment for claims 2-5, 7-11, 13,

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and 15. For example, William Ross, a needle designer for Torrington Company, stated: "Far from seeing larger cutouts as a solution to hook breakage, Torrington's needle designers, and I myself, believed that larger cutouts would lead to increased needle failures (including increased hook breakage). . ." Kurt Wiednhofer, a needle designer for Groz-Beckert, stated: "[U]ntil 1979, [Groz-Beckert's] needle designers, including myself, apprehended that reduction below the 1.4 mm stem height would result in a whippy needle susceptible, *inter alia*, to butt jamming and undesirable needle lengthening." Finally, Groz-Beckert submitted evidence of a computer modeling analysis that Sulzer Morat had performed before the '053 invention. The analysis had predicted that reducing the height of stem segments would cause *increased* hook breakage. Thus, when the '053 inventors informed Martin Elsasser, a knitting engineer in charge of development at Sulzer Morat, of their prototypes and the results, he told them that "the suggestion of reducing the height of the stem segment, as their experiments suggested, was not a good idea." Based on the computer modeling analysis, he believed that "reducing the height of the stem segment would cause increased needle hook breakage, contrary to the results of the experiments."

In sum, factual issues remain about skepticism and teaching away at the time of invention. These genuine issues of material fact preclude resolution on summary judgment of the question of the existence of these secondary considerations.

## VI.

The evidence in the record raises genuine issues of fact concerning the content of the prior art as well as several secondary considerations. This court concludes that these issues are material to an obviousness determination in this case. Accordingly, this court vacates the district court's grant of summary judgment and remands for further proceedings.

## COSTS

Each party shall bear its own costs.

**VACATED and REMANDED .**

**Footnote \*.** Chief Judge Haldane Robert Mayer assumed the position of Chief Judge on December 25, 1997.

**- End of Case -**  
**95513**

Dow Chemical Co. v. American Cyanamid Co. (CA FC) 2 USPQ2d 1350 (4/8/1987)

**Dow Chemical Co. v. American Cyanamid Co. (CA FC) 2 USPQ2d 1350 (4/8/1987)**

**Dow Chemical Co. v. American Cyanamid Co.**

**U.S. Court of Appeals Federal Circuit CA FC  
2 USPQ2d 1350  
4/8/1987**

**Decided April 8, 1987  
No. 85-2749**

**Dow Chemical Co. v. American Cyanamid Co. (CA FC) 2 USPQ2d 1350 (4/8/1987)**

**Headnotes**

**Dow Chemical Co. v. American Cyanamid Co. (CA FC) 2 USPQ2d 1350 (4/8/1987) \ Headnotes**

**PATENTS**

**1. Patentability/Validity -- Obviousness -- Evidence of (§ 115.0903)**

Subject matter of claimed chemical conversion process using copper catalyst for hydration would not have been obvious, since copper catalyst functioned differently in one prior art reference, since other prior art references would lead one skilled in art away from copper catalysts, and since objective evidence of nonobviousness, particularly failure of others and long-felt need, satisfies requirements of 35 USC 103.

**Particular patents -- Catalysts**

3,631,104, Habermann and Tefertiller, Catalysts for the Hydration of Nitriles to Amides, holding of

validity of claim 26 affirmed.

3,994,973, Habermann and Tefertiller, Catalysts for the Hydration of Nitriles to Amides, holding of validity of claim 13 affirmed.

3,758,578, Habermann and Tefertiller, Hydration of Nitriles to Amides Using Cupreous Catalysts, holding of validity of claim 10 affirmed.

**Dow Chemical Co. v. American Cyanamid Co. (CA FC) 2 USPQ2d 1350 (4/8/1987)**

**Case History and Disposition:**

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Appeal from District Court for the Eastern District of Louisiana, Beer, J., 229 USPQ 171.

Action by Dow Chemical Co., against American Cyanamid Co., for patent infringement. From judgment for plaintiff, defendant appeals on issue of validity. Affirmed; Davis, Circuit Judge, dissenting with opinion.

**Attorneys:**

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Bernd W. Sandt, Midland, Mich. (Dugald S. McDougall, of McDougall, Hersh & Scott, both of Chicago, Ill., and Michael S. Jenkins and Charles J. Enright, both of Midland, Mich., of counsel), for appellee.

**Judge:**

Before Markey, Chief Judge, and Rich and Davis, Circuit Judges.

**Opinion Text**

**Opinion By:**

Rich, Circuit Judge.

**Dow Chemical Co. v. American Cyanamid Co. (CA FC) 2 USPQ2d 1350 (4/8/1987) \ Opinion Text**

This appeal is from the final judgment of the United States District Court for the Eastern District of Louisiana, 615 F.Supp. 471, 229 USPQ 171 (1985), holding that certain claims of plaintiff-appellee Dow Chemical Company's (DOW) U.S. Patents No. Re 31,430 ('430 reissue patent), No. 3,994,973 ('973 patent), and No. 3,642,894 ('894 patent), are not invalid and were infringed by defendant-appellant American Cyanamid Company (Cyanamid), and that Dow's U.S. Patent No. Re 31,356 (the '356 reissue patent) is not invalid but was not infringed by Cyanamid. The parties do not in this appeal challenge the findings on the infringement issue. We affirm the judgment on the issue of the validity of the claims in suit.

## I. BACKGROUND

The four patents in suit relate to a chemical process of using a copper catalyst to convert an olefinic nitrile having 3 to 6 carbon atoms to its corresponding amide. Dow asserted that Cyanamid infringed its patents by using a process for catalytically converting acrylonitrile to acrylamide with a copper catalyst prepared by reducing a combination of copper compounds.

### A. The Chemistry

Acrylonitrile is a commonly produced chemical, and its conversion to acrylamide is

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an extremely valuable commercial process. That process, in which water is combined with acrylonitrile to produce acrylamide, is known as a "hydration" process, more specifically the "hydrolysis" of a nitrile, acrylonitrile, to its corresponding amide, acrylamide.

A nitrile is an organic compound containing a carbon-to-nitrogen triple bond and, depending on the rest of the molecule, can be classified as either aromatic or aliphatic. Aliphatic compounds can be either saturated or unsaturated. A saturated aliphatic compound is one in which all the bonds between the carbon atoms are single bonds, while an unsaturated compound is one in which at least two carbon atoms are joined by double (olefinic) or triple (acetylenic) bonds. Acrylonitrile is an unsaturated aliphatic nitrile, more specifically an olefinic nitrile expressed by the chemical formula CH<sub>2</sub>=CH-C≡N.

In the hydrolysis or hydration of acrylonitrile to acrylamide, a molecule of water reacts with the nitrile group of the acrylonitrile molecule to form acrylamide, CH<sub>2</sub>=CH-CONH<sub>2</sub>. The conventional industrial method of producing acrylamide involves mixing acrylonitrile with sulfuric acid and water to form acrylamide sulfate, which is then decomposed to acrylamide by reaction with ammonia, resulting in the formation of the by-product ammonium sulfate as well as acrylamide. The process now used by both Dow and Cyanamid, however, involves contacting the acrylonitrile with water in the presence of a copper catalyst, thereby forming acrylamide directly without the formation of any by-products.

For the purposes of this appeal, Cyanamid apparently concedes that its method for producing acrylamide would infringe the Dow patents. Cyanamid contends, however, that the Dow patents are invalid for claiming "unpatentably obvious" subject matter, arguing that one of ordinary skill in the art,

who would be a Ph.D. chemist with industrial experience, having knowledge of the prior art, would have predicted and expected that certain copper catalysts, which had been employed generally in the nitrile conversion process, would also convert acrylonitrile to its corresponding amide.

The chemical process at issue is generally similar to the process that was at issue in *Standard Oil Company v. American Cyanamid Company*, 774 F.2d 448, 227 USPQ 293 (Fed. Cir. 1985) (*Standard Oil*). In that case, this court affirmed a decision of Judge George Arceneaux of the same United States District Court for the Eastern District of Louisiana, holding claim 2 of Standard Oil's U.S. Patent No. Re 25,525 (the Greene patent) invalid for obviousness. The Green *e* patent also claimed a process for converting acrylonitrile to acrylamide using a different copper catalyst. In the *Standard Oil* case, the district court relied on two prior art references in support of its conclusion. Those references were U.S. Patent No. 1,891,055, issued in 1932 to Walter Reppe (the Reppe patent) and a series of articles written by Dr. Kenichi Watanabe (the Watanabe articles). Those same two references, along with the Greene patent and U.S. Patent No. 3,669,639, issued to Louis Haefel *e* in 1968 (the Haefele patent), constitute the principal prior art which Cyanamid here asserts renders the Dow patents in suit invalid.

We note additionally that although the *Standard Oil* case and this one involve generally similar conversion processes -- acrylonitrile to acrylamide using a copper catalyst -- the claims, patents, and records in these cases are dissimilar and thus we are in no way bound by that prior decision.

## B. The Prior Art

### 1. The Reppe Patent

The Reppe patent, No. 1,891,055, uses copper catalysts to carry out the *hydrogenation* (the direct addition of *hydrogen* to the carbo-carbon bond of an unsaturated nitrile, to form a saturated nitrile, as distinguished from hydration, which is the addition of *water* to the carbon-nitrogen bond) of unsaturated nitriles to form an unsaturated amide. It discloses, *inter alia*, that *after* hydrogenation and *separation* of the copper catalysts from the reaction mixture, the saturated nitriles can be converted to their corresponding amides by the addition of water. Example 2 of the Reppe patent discloses the formation of propionitrile, a saturated aliphatic nitrile and its corresponding amide, propionamide, from crude acrylonitrile, using a catalyst prepared by the reduction of copper carbonate.

### 2. The Watanabe Articles

Dr. Watanabe published a series of articles<sup>1</sup> confirming the efficacy of hydrating aliphatic and aromatic nitriles to their corresponding amides using metallic nickel catalysts. Dr. Watanabe also used metallic copper catalysts but with poor results; he stated

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that they were not as useful because of undesirable side reactions. A 1964 Watanabe article reports the details of experiments converting benzonitrile (an aromatic nitrile) to benzamide using, *inter alia*, copper catalysts, including precipitated copper, copper oxide and Urushibara copper, which is a metallic copper prepared by the reduction of copper chloride. The results of the experiments reported indicated that when the Urushibara copper catalyst was used to convert an aromatic nitrile to its corresponding amide the results were unsatisfactory.

### **3. The Greene Patent**

The U.S. Greene patent, No. 3,381,034 (reissued as Re 28,525), discloses a homogeneous catalytic system consisting of soluble copper ions alone or in combination with metallic copper ions that will convert aromatic and aliphatic nitriles to their corresponding amides. The patent states that metallic copper alone is *not* an effective catalyst for converting acrylonitrile to acrylamide.

### **4. The Haefele Patent**

The Haefele U.S. patent, No. 3,366,639, describes the use of large amounts of the catalyst manganese dioxide to accomplish the hydration of a variety of nitriles, including aromatic, aliphatic, and olefinic nitriles, to their corresponding amides. It does not disclose the use of copper or any catalyst other than manganese dioxide but does state that its process is applicable to production of amides from nitriles in general.

## **C. The Patents at Issue and Their Prosecution**

All of the DOW patents at issue here are continuations-in-part of an application filed in January of 1969 that eventually matured into U.S. Patent No. 3,597,481 (the '481 patent). The four patents that are asserted by Dow to be infringed by Cyanamid here are continuations-in-part of a June 1969 application that eventually became U.S. Patent No. 3,631,104 (the '104 patent), which was a continuation-in-part of the '481 patent application. The '104 patent was reissued as the '430 reissue patent on October 25, 1983.

### **1. The '430 Reissue Patent**

The original claims of the '104 patent were directed to a process for converting aliphatic nitriles in general to their corresponding amides in the presence of a copper catalyst prepared by reducing various copper oxides. On February 26, 1981, ten years after the '104 patent issued, Dow filed a "no defect" reissue application, in which it disclosed several new references to the Patent and Trademark Office (PTO), including the German equivalent of the Reppe patent.

In the first office action on the reissue, the examiner rejected all claims directed to the hydration of aliphatic nitriles in general as obvious in view of the German Reppe patent. In response, Dow conceded that the Reppe patent disclosure might render their broader claims obvious but maintained that it disagreed with the examiner's decision. Dow proposed limiting the claims to hydration of olefinic nitriles of 3 to 6 carbon atoms, and the claims were then allowed.

Claim 26 of the '430 reissue patent, the one considered by the district court, reads:

26. The process of Claim 16 wherein the nitrile is acrylonitrile.

Claim 16, not in issue, reads:

16. In the process for converting a nitrile to the corresponding amide by contacting an olefinic nitrile of 3 to 6 carbon atoms in the presence of water with a heterogeneous catalyst, the improvement comprising using a cupreous catalyst consisting essentially of reduced copper oxide, reduced copper chromium oxide, reduced copper-molybdenum oxide, unreduced copper-molybdenum oxide or mixtures thereof.

## 2. The '894 Patent

The first of a number of applications filed by Dow as continuations-in-part of the '104 patent application issued as the '894 patent. Claim 6, the one claim considered by the district court, is directed to the same basic process for converting an acrylonitrile to its corresponding amide. The difference between this claim and claim 26 of the '430 reissue patent is an additional step of "at least partially protecting the reduced catalyst from contact with oxygen after reduction."

## 3. The '973 Patent

The '973 patent is similar to the '430 reissue patent. Claim 13, the only claim considered by the district court, defines a process for converting an acrylonitrile to its corresponding amide "in the presence of a catalytic amount of copper prepared by reducing copper oxide." The district court held Claim 13 infringed by Cyanamid.

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## 4. The '356 Reissue Patent

A fourth Dow patent, also a continuation-in-part of the application for the '104 patent, issued September 11, 1973, as No. 3,758,578 (the '578 patent) and was reissued August 23, 1983, as the '356 reissue patent. Claim 10, the only claim in suit, defines the process of converting acrylonitrile to acrylamide using a copper salt catalyst. The district court held that claim 10 was not infringed because it found that the catalysts used by Cyanamid were prepared by reducing copper oxides, not copper salts.

## D. The Objective Evidence of Nonobviousness

The record indicates that there was a long-felt need to find a better way to manufacture acrylamide than by the sulfuric acid process. Dow urges that the shift to a catalytic process by both Dow and Cyanamid and Cyanamid's admitted adoption of a process based *inter alia* on information gleaned from the Dow patents are both objective factors tending to support the patentability of Dow's claimed process. Cyanamid argues that there was no evidence of nexus between the commercial success of Dow's acrylamide business and any aspect of the claimed invention, and further urges that the commercial success enjoyed by both Dow and Cyanamid was more probably attributable to a market demand for acrylamide.

Cyanamid conceded that the Dow patents provide one common disclosure to the public of a chemical process for the conversion of nitriles to amides, but noted at trial that the only distinction of Dow's invention from prior known processes is Dow's claim limitation to one subgroup of nitriles, namely, olefinic nitriles of 3 to 6 carbon atoms. Thus, Cyanamid asserted that the subject matter of the patents as a whole would have been obvious to one of ordinary skill in the art at the time that Dow's inventions were made. With respect to the obviousness of the claimed invention, Dow asserted that Cyanamid's copying of Dow's process, the great need to commercialize the process, and the commercial success enjoyed by Dow were compelling evidence of nonobviousness.

Trial to the district court sitting without a jury lasted seven days, during which time the district court

heard the testimony of one of the Dow patentees, Dr. Ben Tefertiller, as well as two chemical experts on behalf of Cyanamid and an expert in the field of patent practice on behalf of Dow. The district court issued its decision, including findings of fact and conclusions of law, on August 14, 1985.

## II. The District Court's Opinion

The only district court conclusion at issue is the legal question of nonobviousness. In addressing it the district court first noted the *Graham* inquiries, emphasizing objective evidence of nonobviousness such as long-felt need, unexpected results, commercial success and failure of others.

The court then turned to an analysis of the prior art and a comparison of each reference with the claimed invention, which the court characterized as "the hydration of acrylonitrile to acrylamide using a reduced copper compound as a catalyst." In discussing the Reppe patent, the district court found that it taught that reduced copper catalysts are useful for the hydrogenation of unsaturated nitriles to the corresponding saturated nitriles and that after hydrogenation the saturated nitrile can be converted to an amide by the addition of water. The district court concluded its analysis by stating that the Reppe patent "does not disclose the hydration of acrylonitrile to acrylamide using a reduced copper catalyst."

The district court found that the Watanabe articles indicated that the hydration of aliphatic nitriles was somewhat different from the hydration of aromatic nitriles, and that metallic copper catalysts "gave poor results as catalysts for hydration." In addition, the court noted that "Dr. Watanabe taught that the catalysts could be exposed to air during their preparation." The court concluded with the statement that "[t]he reference does not disclose the hydration of acrylonitrile to acrylamide with a reduced copper compound as a catalyst."

The district court acknowledged that the Greene patent "taught that soluble copper ions would convert aromatic and aliphatic nitriles, including acrylonitrile, to their corresponding amides" but also found that it stated "that metallic copper alone was not an effective catalyst for converting acrylonitrile to acrylamide." Similarly, the court noted that the Haefelete patent "disclosed the use of large amounts of manganese dioxide as a catalyst with an organic solvent to convert nitriles, including acrylonitrile, to the corresponding amide," but found that "[t]he reference does not disclose the use of a reduced copper compound to catalyze the hydration of acrylonitrile to acrylamide."

The court then concluded "that there are differences between the subject matter

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claimed by Dow in the patent-in-suit [sic] and the prior art when taken as a whole, and that such differences would not be [sic, have been] obvious to those skilled in the art." The court found those differences to be, *inter alia* that "the hydration of nitriles by the use of a copper catalyst obtained through the reduction of a copper compound was not predictable." The court also stated that the process claimed in the Dow patents was "limited to the conversion of certain unsaturated nitriles, particularly acrylonitrile, to its corresponding unsaturated amide." The court found that process to be different "from the prior art in the nature of the nitrile hydrated" because the prior art showed the hydration of only "saturated and aromatic nitriles."

Finally, the district court acknowledged several secondary considerations to support its conclusion that the Dow patents had not been proven invalid. The court found that Dow was able to build a full-size

plant, utilizing its patented invention to replace the sulfuric acid process. The court was also impressed by the fact that the Dow process "produces high yields of pure acrylamide . . . with little or no by-product." That fact, coupled with Cyanamid's apparent inability to develop its own commercial process based on the prior art, indicated to the court that Dow's patented invention would not have been obvious.

Two weeks later the court issued its judgment, holding the '430 reissue patent, the '894 patent, the '973 patent, and the '356 reissue patent valid and enforceable. The court then held that Cyanamid infringed claim 26 of the '430 reissue patent, claim 6 of the '894 patent, and claim 13 of the '973 patent, and permanently enjoined Cyanamid from practicing the processes of those claims.<sup>2</sup> The injunction was stayed pending appeal to this court.

### III. OPINION

The district court correctly recognized that Reppe discloses a process in which unsaturated nitriles are converted to saturated ones by using a copper catalyst and in which the *saturated* nitrile is then converted to its corresponding amide but *without* the use of the copper catalyst as in the claimed inventions. The disclosure is of a two-step process, and the district court acknowledged that distinction in making its *Graham* inquiry.<sup>3</sup>

The district court recognized that the Watanabe articles disclose the use of copper catalysts to successfully convert aromatic and aliphatic nitriles to their corresponding amides, and Watanabe's statement that "[i]t has been found that the usual catalysts for hydrogenation are generally effective in the hydration of nitriles." The court found that Watanabe did not suggest the use of copper catalysts to convert acrylonitrile to acrylamide because his results showed that the yields of amide obtained in such a manner were very poor compared to the use of nickel catalysts, that copper catalysts gave unexpected side reactions, and that some copper catalysts caused the formation of amines rather than amides, all of which would have suggested the undesirability of a process as defined by the claims in issue. There is nothing in the record to support a conclusion that these findings are clearly erroneous, and thus we are not convinced that a mistake has been made.

The Greene reference shows that a catalyst composed of the *combination* of soluble copper ions and metallic copper will convert a wide range of nitriles to amides, including olefinic nitriles of 3 to 6 carbon atoms and specifically including acrylonitrile. That art also explicitly states, as found by the district court, that copper metal *alone* "is not an effective catalyst for [converting a nitrile to its corresponding amide]," and to that extent teaches away from the claimed invention's use of copper metal as a catalyst.

The Haefele patent relates only to the use as a catalyst of manganese dioxide to convert numerous different nitriles. The present case is concerned with copper catalysts.

With regard to objective evidence of nonobviousness, the district court found that "Dow's efforts were successful, not only scientifically, but also commercially in that

Dow was able to build a full-size plant utilizing its patented invention that replaced the sulfuric acid process." The record reflects that this success was possible because the claimed invention unblocked a cost barrier to the market; it displaced the prior inefficient process burdened with the costs of extra

reagents and an ammonium sulfate by-product. While Cyanamid's argument that Dow has not shown that its increase in sales resulted from the claimed invention may be well taken, there is other strong objective evidence of nonobviousness in the record as found by the district court.

The finding that the claimed invention resolved a long-felt need to do away with the wasteful sulfuric acid process and its unwanted by-products tends to show the nonobviousness of the claimed invention as does failure of others and copying; Cyanamid tried but failed to develop the claimed invention and copied it instead.

[1] Based on all of the above, we conclude that the subject matter of the four claims of the four patents in suit would not have been obvious to one of ordinary skill in the art at the time those inventions were made. The Reppe prior art discloses copper metal catalysts and hydration, but when the distinction between using that copper catalyst in hydrogenation and not in hydration is made, that disclosure is not meaningful to the obviousness of the claimed invention; in Reppe, the copper catalyzed the saturation of the carbon-carbon bonds of the nitrile, not its hydration, to an amide, the subject matter of the claims in suit. The fact that the 1964 Watanabe article states that the usual hydrogenation catalysts are "generally effective" in the hydration of nitriles to amides might suggest the claimed invention when viewed in combination with Reppe if it were not for the fact that Watanabe also states that copper metal catalysts give *poor* yields and unexpected side reactions, the first of which the court found the claimed invention *excelled* in. Furthermore, taking the Greene reference as a whole in combination with Reppe and Watanabe, we can only conclude that its explicit statement that copper catalysts were ineffective for use in hydrating nitriles would lead one of ordinary skill in the art away from the claimed invention. Finally, the Haefele prior art adds little to the equation of obviousness. Lastly, the objective evidence of nonobviousness, particularly failure of others and long-felt need, lends much to our conclusion that the claimed invention fully satisfies the requirements of 35 USC 103.

#### IV. CONCLUSION

Accordingly, the district court's holding that the claims in suit of the four patents in suit, Re 31,430, No. 3,994,973, No. 3,642,894, and Re 31,356, are not invalid is *affirmed*.

*AFFIRMED*

**Dow Chemical Co. v. American Cyanamid Co. (CA FC) 2 USPQ2d 1350 (4/8/1987)**

#### Footnotes

**Dow Chemical Co. v. American Cyanamid Co. (CA FC) 2 USPQ2d 1350 (4/8/1987) \ Footnotes**  
**Footnote 1.** Bull. Chem. Soc'y Japan 1325-29 (1964); 39 Bull. Chem. Soc'y Japan 8-14 (1966).

**Footnote 2.** It would be inappropriate for a district court to state in its judgment form that four *patents* are valid if only one claim of each were asserted and tried. See 35 USC 282. In this case, there is no indication that the four claims tried were stipulated as "representative," and the district court mentioned but did not specifically rule on Cyanamid's counterclaim for a declaratory judgment of patent invalidity.

The district court should consider whether its judgment with respect to validity should be recast to limit it to the claims in suit.

**Footnote 3.** We are not persuaded by Dow's so-called concession during prosecution that Reppe "can be interpreted as disclosing the formation of aliphatic amides from the corresponding aliphatic nitriles using copper catalysts" because this evidence is ambiguous, was before the district court, and we may not redetermine its weight and credibility. See *Inwood Laboratories, Inc. v. Ives Laboratories, Inc.*, 456 U.S. 844, 856, 214 USPQ 1, 7 (1982).

**Dow Chemical Co. v. American Cyanamid Co. (CA FC) 2 USPQ2d 1350 (4/8/1987)**

**Dissenting Opinion Text**

**Dissent By:**

Davis, Circuit Judge, dissenting.

**Dow Chemical Co. v. American Cyanamid Co. (CA FC) 2 USPQ2d 1350 (4/8/1987) \ Dissenting Opinion Text**

**I.**

In my view, a contrary result is compelled by this court's earlier decision in *Standard Oil Co. v. American Cyanamid Co.*, 774 F.2d 448, 227 USPQ 293 (Fed. Cir. 1985) (*Sohio*).<sup>1</sup> The chemical process involved here is substantially the same process at issue in *Sohio*, although the challenged patents are different. Because of the general identity of the chemical process, there are holdings in *Sohio* that bear directly on the correctness of the District Court's decision in this case. The most important of these is our *Sohio* holding that the District Court there correctly "found that the combined teachings [of the Watanabe article and Reppe patent]<sup>2</sup> would have indicated to one of ordinary skill in the art that copper<sup>3</sup> was an effective agent for producing a catalysis in the process of converting a nitrile to an amide." 774 F.2d at 455, 227 USPQ at 298.<sup>4</sup> This was a legal determination of obviousness, but in the current case Judge Beer made the precisely contrary determination that "the hydration of nitriles by the use of a copper catalyst obtained through the reduction of a copper compound was not predictable, and was not obvious." Because *Sohio* is a binding legal precedent on this exact point,<sup>5</sup> the District Court's contrary legal holding should not stand. But that

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erroneous holding of the District Court was a mainstay of its opinion sustaining the validity of the patents at issue in this case.

**II.**

Spelling out the matter somewhat further, my thought is that the District Court erred, as a matter of law, in holding that the Dow patents would not have been obvious under 35 U.S.C. § 103. The court first discussed each of the pertinent prior art references separately and, on that basis, was able to conclude that none of those references specifically disclosed the hydration of acrylonitrile to acrylamide

using a reduced copper compound. It goes without saying, however, that it is not necessary, under §103, that each and every element of the claimed invention be disclosed in a prior art references. Such an analysis is properly addressed only for the issue of anticipation under 35 U.S.C. § 102. *W.L. Gore & Assocs. v. Garlock, Inc.*, 721 F.2d 1540, 1554, 220 USPQ 303, 313 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). Rather, the proper analysis under §103 is whether the invention, taken as a whole, would have been obvious to one skilled in the art. *Environmental Designs Ltd. v. Union Oil Co.*, 713 F.2d 693, 398, 218 USPQ 865, 870 (Fed. Cir. 1983) *cert. denied*, 464 U.S. 1043 [ 224 USPQ 520 ] (1984).

While the District Court did make two conclusions on obviousness purportedly based on the prior art considered as a whole, to my mind both conclusions must be rejected. First, the court decided that the prior art taught that the hydration of nitriles was not obvious since it was not predictable. As discussed *supra*, this conclusion runs directly contrary to this court's holding in *Sohio* and therefore should not be accepted since it involved the identical prior art. Second, the court concluded that the "process claimed in the Dow patents, therefore, differ from the prior art in the nature of the nitrile hydrated and the nature of the resultant amide" (e.g., acrylonitrile hydrated to acrylamide). This conclusion is unsupported by the District Court's own opinion which acknowledged that the Greene Patent (U.S. Letters Patent 3,381,034) taught that a copper catalyst could be used to convert "aromatic and aliphatic nitriles, including acrylonitriles, to their corresponding amides."

I would reverse the decision of the District Court.

#### Dow Chemical Co. v. American Cyanamid Co. (CA FC) 2 USPQ2d 1350 (4/8/1987)

#### Footnotes

#### Dow Chemical Co. v. American Cyanamid Co. (CA FC) 2 USPQ2d 1350 (4/8/1987) \ Footnotes

**Footnote 1.** *Sohio* came to us on appeal from the same District Court as tried the current suit (the Eastern District of Louisiana) but from a different judge of that court.

**Footnote 2.** These two references are likewise present in the current case.

**Footnote 3.** The *Sohio* courts made no distinction between copper in its ionic state and reduced metallic copper as used in the catalytic conversion at issue.

**Footnote 4.** Our *Sohio* opinion also specifically upheld that District Court's appraisal of the Watanabe and Reppe references. 774 F.2d at 454-55, 227 USPQ at 298.

**Footnote 5.** I do not rely at all on principles of former adjudication (*res judicata*) but on the rule that a less than in banc panel of this court is required to follow the legal determinations of a prior panel.

**- End of Case -**  
**31259**

In re Schechter and LaForge, 98 USPQ 144 (CCPA 1953)

**In re Schechter and LaForge**

(CCPA)

98 USPQ 144

· 6/3/1953

Decided June 3, 1953

Appl. No. 5935

U.S. Court of Customs and Patent Appeals

**In re Schechter and LaForge, 98 USPQ 144 (CCPA 1953)**

**Headnotes**

**In re Schechter and LaForge, 98 USPQ 144 (CCPA 1953) \ Headnotes**

**PATENTS**

**1. Appeals to Court of Customs and Patent Appeals-Issues to be determined-Ex parte patent cases**

Applicant does not challenge rejection of claims as drawn to nonelected species; accordingly, court does not consider such claims on merits.

**2. Claims-Indefinite**

Provision of R.S. 4888 that inventor "particularly point out and distinctly claim" was carried forward with slight modification of language into 35 U.S.C. 112.

**3. Claims-Broad or narrow-Chemical cases**

**Claims-Indefinite**

### **Claims-Negative expressions**

Claim stating that "R is an alkenyl radical other than 2-butenyl and 2, 4-pentadienyl" does not comply with 35 U.S.C. 112; quoted portion is negative limitation rendering claim indefinite and unpatentable; it is attempt to claim invention by excluding what applicants did not invent rather than by particularly and distinctly pointing out what they did invent; claim is broad generic claim in which applicants seek to establish monopoly of all such cyclopentenolones, whether known or unknown, excepting two prior art compounds recited in quoted portion; noncompliance with statute is particularly clear since there is high degree of unpredictability in art.

### **4. Claims-Indefinite**

#### **Claims-Negative expressions**

In determining whether part of claim is negative limitation of type rendering claim fatally indefinite, court must look to substance and not mere form of language in which claim is cast; limitation though affirmative in form may be negative in substance, and vice versa; essential question is whether claim meets requirements of R.S. 4888 and 35 U.S.C. 112; thus, claim contains improper negative limitation where it states that "R is a hydrocarbon radical taken from the group consisting of those having less than four and those having more than five carbon atoms."

### **5. Appeals to Court of Customs and Patent Appeals-Weight given decisions below**

Concurrent findings of lack of inventive novelty by Patent Office tribunals are not conclusive upon court, but they are persuasive since tribunals presumably are familiar with art.

### **6. Claims-Broad or narrow-Chemical cases**

If generic Markush type claim includes one or more members known to be old in art for same purpose as in applicant's invention, group in its entirety must fail of recognition in exactly same manner as would have been the case had group of elements of claim been identified by single term; in such contingency, formula of lesser scope may be invoked, provided that remaining members of group have common quality which is distinctive from characteristics of major group, and which itself imparts patentable merit to subgroup over generic group.

### **7. Claims-Broad or narrow-Chemical cases**

Markush grouping is proper where substances grouped have community of chemical and physical characteristics which justify their inclusion in common group, and such inclusion is not repugnant to principles of scientific classification; grouping is not improper although prior art products may be esterified with same acid, since such esterification merely results in original starting ester from which they were made and thus such products cannot serve as tool to yield specific end product; hence, grouping

properly excludes prior art products.

**8. Claims-Broad or narrow-Chemical cases**

Whether Markush grouping is proper must be decided in view of facts of each case.

**9. Claims-Broad or narrow-Chemical cases**

Claims to Markush type subgroup must have patentable merit over major group which includes members old in art; if any one or more of compounds included in subgroup is not inventive and patentable over old compounds in major group, claim to subgroup is unpatentable.

**10. Patentability-Invention-In general**

Novel useful chemical compound which is homologous or isomeric with prior art compounds is unpatentable unless it possesses some unobvious or unexpected beneficial property not possessed by prior art compounds; however, homologs and isomers may be patentable if they are inventive over known prior art compounds.

**11. Patentability-Evidence of patentability-In general**

**Patentability-Evidence of patentability-Commercial success**

**Patentability-Evidence of patentability-Delay and failure of others to produce invention**

**Patentability-Invention-In general**

Compounds claimed were not available before synthesized by applicants; compounds made it possible to synthesize for the first time specific highly successful insecticides; preparation of compounds required discovery and development of complex process of synthesis and new class of starting materials; other competent researchers failed in efforts to synthesize compounds; there is considerable degree of unpredictability in insecticide field with homologs, isomers, and analogs of known effective insecticides having proven ineffective as insecticides; in view of above factors, court concludes that compounds are inventive and patentable over prior art, albeit they include isomers and homologs of prior art compounds; considering history of art at time of invention, occasion for invention, and its success, such conclusion is unavoidable.

**12. Appeals to Court of Customs and Patent Appeals-Issues to be determined-Ex parte patent cases**

**Patentability-Evidence of patentability-In general**

Allowability of appealed claim is not controlled by fact that similar claims have been allowed in Patent Office, since appealed claim must be patentable in its own right in opinion of court; however, similar claims allowed by Office furnish evidence of what features Office regards as patentable, and it is proper, and sometimes necessary, for court to consider allowed claims in order to fully determine views of Board and examiner.

**Particular patents-Cyclopentenolone**

Schechter and LaForge, Synthesis of 4-Hydroxy-2-Cyclopenten-1-Ones, claim 48 of application allowed; claims 17, 46, and 47 refused.

**In re Schechter and LaForge, 98 USPQ 144 (CCPA 1953)  
Case History and Disposition:**

Page 145

Appeal from Board of Appeals of the Patent Office.

Application for patent of Milton S. Schechter and Frederick B. LaForge, Serial No. 75,282; Patent Office Division 31. From decision rejecting claims 17 and 46 to 48, applicant appeals. Affirmed as to claims 17, 46, and 47; reversed as to claim 48.

**Attorneys:**

T. A. Seegrist (L. M. Mantell of counsel) both of Washington, D. C., for appellants.

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E. L. Reynolds (J. Schimmel of counsel) for Commissioner of Patents.

**In re Schechter and LaForge, 98 USPQ 144 (CCPA 1953) \ Attorneys:**

**Judge:**

Before Garrett, Chief Judge, and O'Connell, Johnson, Worley and Cole, Associate Judges.

**In re Schechter and LaForge, 98 USPQ 144 (CCPA 1953)**

## Opinion Text

### Opinion By:

Johnson, Judge.

### In re Schechter and LaForge, 98 USPQ 144 (CCPA 1953) \ Opinion Text

This is an appeal from the decision of the Board of Appeals of the United States Patent Office affirming the action of the Primary Examiner in finally rejecting claims 17, 19, 20, 21, 23, 46, 47 and 48 of appellants' application, serial No. 75,282, for a patent on "Synthesis of 4-Hydroxy-2-Cyclopenten-1-Ones." All appealed claims are product claims. Twelve method claims and one product claim, claim 18, were allowed by the examiner.

[1] Claims 19, 20, 21 and 23 have been rejected as drawn to non-elected species and that rejection is not challenged by appellants. Accordingly, those claims will not be considered on their merits by this court. See In re Jones, 34 C.C.P.A. (Patents) 1168, 162 F.2d 638, 74 USPQ 152 .

Appealed claims 17, 46, 47 and 48 read as follows:

17. A synthetic cyclopentenolone of the formula:

*Graphic material consisting of a chemical formula or diagram set at this point is not available.  
See text in hard copy or call BNA PLUS at 1-800-452-7773 or 202-452-4323.*

in which R' is a radical taken from the group consisting of alkyl, alkenyl and aryl and R is an alkenyl radical *other than 2-but enyl and 2, 4-pentadienyl*.

46. A racemic synthetic compound of the formula defined in claim 17.

47. A synthetic 4-hydroxy cyclopentenolone of the formula:

*Graphic material consisting of a chemical formula or diagram set at this point is not available.  
See text in hard copy or call BNA PLUS at 1-800-452-7773 or 202-452-4323.*

in which R is a hydrocarbon radical taken from the group consisting of those having less than four and those having more than five carbon atoms, the R radical having at least one olefinic double bond, and in which R' is a hydrocarbon radical.

48. A 4-hydroxy cyclopentenone of the group consisting of 2-Allyl-4-hy-hydroxy-3-methyl-2-cyclopenten-1-one;

4-Hydroxy-3-methyl-2-(2-methylallyl)-2-cyclopenten-1-one; *synthetic racemic*

*2-(2-but enyl)-4-hydroxy-3-methyl-2-cyclopenten-1-one, the semi-carbazone of which has a melting point with decomposition at about 222-223° C.;*

*2-(3-Butenyl)-4-Hydroxy-3-methyl-2-(3-methyl-2-but enyl)-2-cyclo penten-1-one; 4 - hydroxy - 3 - methyl-2-cyclopenten-1-one; and 2-Allyl-4-hydroxy-3-phenyl-2-cyclopenten-1-one.*

The present application relates to the preparation of a new class of synthetic organic compounds called cyclopentenolones, which are used as intermediates in the synthesis of pyrethrinlike insecticides by

esterifying the said cyclopentenolones. Appellants state that they believe they are the first to succeed in synthesizing pyrethrinlike insecticides. Heretofore, according to appellants, the sole source of pyrethrin insecticides has been from the natural products, mainly from the pyrethrum flower, grown primarily in Kenya Colony, Africa. It appears from the record that this class of natural insecticides consisted of two known natural pyrethrins and two natural cinerins.

The preparation of the cyclopentenolones here claimed required the synthesis of a new class of hydroxydiketone compounds to be used as starting materials. Those starting material compounds are covered by allowed claims in appellants' divisional application, serial No. 168,142, which has issued as U. S. Patent No. 2,574,500.

The final synthetic pyrethrinlike insecticides which are esters of the cyclopentenolones of the appealed claims are covered in allowed claims in another divisional application, serial No. 161,481, issued as U. S. Patent No. 2,603,652.

Appellants claim the inventions of these three applications have led to a new industry devoted to production of synthetic pyrethrinlike insecticides having special desirable properties not possessed by the natural pyrethrins.

The process required to make the claimed cyclopentenolones essentially comprises the following steps: Pyruvaldehyde ( $\text{CH}_3\text{COCHO}$ ), or other substituted glyoxal, is reacted with a sodium salt of a beta-keto acid thereby yielding a hydroxydiketone of the type covered in

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appellants' patent No. 2,574,500. The hydroxydiketone so produced is cyclized to yield the cyclopentenolones of the appealed claims by treating them with a cyclizing agent, such as an aqueous alkali, in accordance with the method of the allowed process claims in the instant case.

The sole reference relied on by the Patent Office tribunals is:

LaForge et al., Journal of the American Chemical Society, vol. 69, page 186, January 1947.

The LaForge et al. article discloses that the alcoholketonic components of the natural pyrethrins have been shown to consist of pyrethrolone and cinerolone which are cyclopentenolones probably having the structure wherein R is

*Graphic material consisting of a chemical formula or diagram set at this point is not available. See text in hard copy or call BNA PLUS at 1-800-452-7773 or 202-452-4323.*

the 2,4 pentadienyl radical (- $\text{CH}_2=\text{CH}-\text{CH}-\text{CH}=\text{CH}_2$ ), and the 2-butenyl radical (- $\text{CH}_2\text{CH}=\text{CH}-\text{CH}_3$ ), respectively. These keto-alcohol components are made through scission, i.e., breaking down, of the natural pyrethrins which are esters of the said keto-alcohol components. Hence, as the examiner pointed out, the old compounds pyrethrolone and cinerolone are not actually "natural" compounds, but they have been consistently identified as such by the examiner, the board, and appellants, apparently for convenience.

All of the appealed claims have been rejected by the examiner as unpatentable over the LaForge et al.

reference. The examiner also rejected claims 17, 46, and 47 as indefinite, and claim 48 was rejected as setting up an improper Markush group. The board affirmed all of these rejections for substantially the same reasons advanced by the examiner.

In rejecting claim 17 as indefinite, the examiner stated:

It is seen that "R" in the structural formula of this claim is defined as "an alkenyl radical other than 2-butenyl and 2, 4-pentadienyl." The latter expression is of negative nature and is considered to render the claim indefinite. The claim does not point out which of all the many possible "alkenyl" radicals are of any special advantage and constitute the invention. To the contrary, this is an improper attempt to claim all compounds except those of the prior art. In re Langdon, [22 C.C.P.A. (Patents) 1245] 77 F.2d 920, 25 USPQ 415 ; In re Rose, [37 C.C.P.A. (Patents) 1034] 182 F.2d 198, 86 USPQ 77 .

Claim 47 was rejected as indefinite similarly to claim 17.

Appellants concede here, as they did before the Patent Office tribunals, that the LaForge et al. article discloses two cyclopentenolone compounds of the type recited in claim 17 in which R is 2-butenyl and 2,4-pentadienyl, respectively. Appellants strongly contend, however, that a claim such as claim 17 is permissible in the circumstances of this case because there are critically novel and inventive patentable differences between the prior art and appellants' claimed cyclopentenolones.

A large number of points are presented by appellants to support this contention. Those points will subsequently be discussed in considering appealed claim 48.

Even if there is a critically novel and inventive patentable difference between the prior art and their invention here claimed, as appellants contend, we think this contention is not actually in point insofar as the rejection of claim 17 as indefinite is concerned.

[2] Under R. S. 4888, it was required that the inventor "shall *particularly point out and distinctly claim* the part, improvement, or combination which he claims as his invention or discovery." This provision has been carried forward into § 112, Title 35, U. S. C. (1952) with slight modification of language.<sup>1</sup>

[3] In the light of the prior art of record, the italicised portion of claim 17 is an attempt by appellants to claim their invention by excluding what they did not invent rather than by particularly and distinctly pointing out what they did invent. Further, it is clear that claim 17 is a broad generic claim in which appellants are seeking to establish a monopoly to *all* such cyclopentenolones, whether known or unknown, excepting the two prior art compounds which are recited in the italicised exclusionary clause of claim 17.

In view of this, we think the examiner properly regarded the italicised portion of claim 17 as a negative limitation. We are also of the opinion that this

renders the claim indefinite and unpatentable. In re Rose, *supra*. See also In re Langdon, *supra*. As this court pointed out in the Rose case, the basic objection to use of expressions of this kind is that there is a failure to comply with the statutory requirement that the applicant shall in his claims particularly point out

and distinctly claim his invention when all he does is claim everything, whether known or unknown, except that which is shown in the prior art.

To support their above-noted contention that they have disclosed subject matter which is patentably inventive over the prior art, appellants have argued that there is a high degree of unpredictability in the insecticide art. Appellants have stated in the record herein that there are many instances when isomers and analogues of excellent known insecticides have proven ineffective as insecticides. This being the case, it seems particularly clear that appellants have not complied with the statute by claiming all but what was previously known.

The examiner rejected claim 47 as indefinite similarly to claim 17. This claim excludes those cyclopentenolones wherein the alkenyl radical has four or five carbon atoms while including all others. The 2-butenyl radical and the 2,4-pentadienyl radical disclosed in LaForge et al. are alkenyl radicals having four and five carbon atoms, respectively. Thus, in claim 47, as in claim 17, appellants seek to claim all such compounds, whether known or unknown, excepting those which are shown in the prior art.

[4] Although the italicised portion of claim 47 is affirmative in form, it is clearly a negative limitation in substance. In determining whether part of a claim is a negative limitation of the type which renders a claim fatally indefinite, we must look to the substance and not the mere form of the language in which the claim is cast. A limitation though affirmative in form may be negative in substance, and vice versa. The essential question is whether the claim meets the requirements of the pertinent provisions of R. S. 4888 and 35 U.S.C. § 112 (1952), *supra*. We therefore think that the principles applied to claim 17 are applicable to claim 47 and we are of the opinion that claim 47 is indefinite and unpatentable.

Claim 46 calls for a racemic mixture of the compounds defined in claim 17. The examiner held claim 46 indefinite for the same reasons as claim 17, stating that "the natural compounds referred to in LaForge et al. article exist as a racemic mixture." The examiner also stated:

\* \* \* It should be noted that the compounds of claim 17 and of LaForge et al. are by mere inspection of their structural formulas capable of rotating light since they contain an asymmetric carbon atom (see Gilman, "Organic Chemistry" (1938), Vol. 1, pages 155-176; or Fieser and Fieser, "Organic Chemistry" (1944), pages 244-279). The skilled chemist would know, therefore, that the compounds involved here are capable of existing in dextro and levo forms and as racemic mixtures thereof.

[5] These statements made by the examiner indicated he was of the opinion that the term racemic does not define anything inventively and patentably novel over the teaching of the LaForge et al. reference. The board in its decision has implicitly concurred in this holding. Concurrent findings of lack of inventive novelty by the Patent Office tribunals are not conclusive upon this court, but they are persuasive since those tribunals presumably are familiar with the art. *In re Kaufmann*, 39 C.C.P.A. (Patents) 769, 193 F.2d 331, 92 USPQ 141. Appellants have presented little to convince us that this holding by the examiner and the board is erroneous. Thus, it seems to us that claim 46 must stand or fall with parent claim 17, and we therefore consider claim 46 indefinite and unpatentable for the reasons applied to claim 17.

In view of the foregoing, the rejection of claims 17, 46 and 47 as indefinite will be sustained. Having reached this conclusion, it is unnecessary to discuss the rejection of these claims as unpatentable over the

LaForge et al. reference.

Claim 48 was rejected as an improper Markush claim, the examiner stating that:

\* \* \* This claim sets up a Markush group which illogically excludes the natural member of this group<sup>2</sup> which is disclosed by LaForge et al. That this is an improper Markush group, and therefore indefinite and alternative is indicated by In re Hass et al., 563 O.G. 576, 60 USPQ 544, 1944 C.D. 234 [31 C.C.P.A. (Patents) 895].

Claim 48 was also rejected on prior art. That rejection will be discussed in detail later in this opinion.

Appellants agree that claim 48 excludes the moieties derived from the

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natural pyrethrin esters. As they point out in their brief, the moiety with a 2-(4-pentadienyl) radical at R is excluded, since it is not recited in the Markush group. That with 2-butenyl at R, which corresponds to the natural cinerolone, is also excluded. This is so because of the expression "the semicarbazone of which has a melting point with decomposition at about 222-223° C." This melting point limitation excludes not only the optically active form but also the racemic form of natural cinerolone. This melting point limitation also limits the Markush species of the claim to the geometric isomer of the naturally derived moiety, since the semicarbazone of the racemic form of the natural moiety has a different melting point.

[6] If on examination of a generic Markush type claim, it be found that the applicant has included one or more members known to be old in the art for the same purpose as in the applicant's invention, the group in its entirety must fail of recognition in exactly the same manner as would have been the case had the group of elements of the claim been identified by a single term. In such contingency, a formula of lesser scope may be invoked, provided that the remaining members of the group have a common quality which is distinctive from the characteristics of the major group, and which itself imparts patentable merit to the subgroup over the generic group. In re Hass et al., *supra*.<sup>3</sup>

[7] A Markush grouping is proper where the substances grouped have a community of chemical and physical characteristics which justify their inclusion in a common group, and such inclusion is not repugnant to the principles of scientific classification. In re Jones, 34 C.C.P.A. (Patents) 1150, 162 F.2d 479, 74 USPQ 149.

Claim 48 lists a series of new synthetic substituted cyclopentenolones disclosed in appellants' application which are produced by cyclizing the hydroxydiketones covered in allowed claims of U. S. patent No. 2,574,500, *supra*. All of these listed cyclopentenolones may be esterified by chrysanthemum monocarboxylic acid to yield active synthetic pyrethrinlike insecticides of the type covered in allowed claims of U. S. patent No. 2,603,652, *supra*. On the other hand, however, the two prior art cyclopentenolones disclosed by LaForge et al. are scission products of the natural pyrethrin esters. Hence, although these scissions products may be esterified with chrysanthemum monocarboxylic acid, such esterification merely results in the original starting ester from which they were made. Manifestly, from a practical viewpoint, if one is seeking a method of synthesizing pyrethrinlike products, to follow such a course is to wend a useless circle. Thus, the prior art scission product cyclopentenolones can in no way serve as a tool in the preparation of synthetic pyrethrinlike insecticides.

In the light of these factors, and in view of other factors discussed below in considering patentability of the compounds recited therein, we think the Markush grouping of claim 48 complies with the requirements of *In re Jones*, *supra*.

Further, appellants' new synthesized cyclopentenolone intermediates are affirmatively recited in the claim and the exclusion of the known prior compounds results merely from claiming a subgroup of lesser scope having a common quality which is distinctive from the characteristics of the major group. This common distinctive quality is that the compounds recited are novel synthesized intermediates produced by a novel process from a novel synthesized starting material for use in a novel method of providing by synthesis the novel desired pyrethrinlike insecticides. We therefore think claim 48 presents a subgroup meeting the first of the two requirements for such subgroups as set out in *In re Hass et al.*, *supra*. In the peculiar facts of this case, we think the recitation of the italicized compound in specific form, whereas the others are recited in broad form so as to include dextro and levo isomers and racemic mixtures, does not, *ipso facto*, make the claim an im-

[8] proper Markush claim. Whether a Markush grouping is proper must be decided in view of the facts in each case. *In re Jones*, *supra*.

Accordingly, the rejection of claim 48 as an improper Markush claim will not be sustained.

[9] The subgroup, however, must have patentable merit over the major group. If any one or more of the compounds included in Markush claim 48 is not inventive and patentable over the *LaForge et al.* disclosure, that claim is unpatentable. *In re Hass et al.* and *Ex parte Burke*, *supra*.

Claim 48 (and claim 20) was further rejected by the Patent Office tribunals as unpatentable over *LaForge et al.* The rejection is based primarily on the ground that the italicised portion of claim 48 (which is the same as claim 20) is drawn to an isomer of the known cinerolone scission product, 2-(2-butenyl)-4-hydroxy-3-methyl-2-cyclopenten-1-one, and that such isomer is not inventive and patentable over the compound of the reference.

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It appears from the record, that synthetic 2-(2-butenyl)-4-hydroxy-3-methyl-2-cyclopenten-1-one recited in claims 20 and 48 is not the same compound as the natural product or any racemized form derivable from natural cinerolone. The natural cinerolone scission product is now known to have a cis double bond linkage, whereas the new synthesized product defined in these claims has a trans double bond. Thus, the latter is a geometrical isomer of the former.

[10] This court has previously held that a novel useful chemical compound which is homologous<sup>4</sup> or isomeric<sup>5</sup> with compounds of the prior art is unpatentable unless it possesses some unobvious or unexpected beneficial property not possessed by the prior art compounds. We also implicitly indicated in the decisions here cited that homologs and isomers may be patentable if they are inventive over known prior art compounds. See also *Parker v. Marzall*, 86 USPQ 446, a decision of the District Court for the District of Columbia.

[11] The examiner and the board nowhere asserted that the compounds affirmatively claimed were

available before appellants devised the synthesis they have disclosed in their application. Nor have those tribunals challenged appellants' claim that the compounds synthesized by them have made it possible to synthesize for the first time highly successful pyrethrinlike insecticides.

The sole reference LaForge et al. does not disclose or even suggest any process for synthesizing even the cyclopentenolone scission products disclosed therein, let alone the new cyclopentenolones disclosed herein. The preparation of the cyclopentenolones here claimed required the discovery and development of a complex process of synthesis, and a new class of patentable hydroxydiketones for starting materials.

Moreover, it appears from the record that the cyclopentenolones of claim 48 when esterified yield improved synthetic pyrethrin analogs having commercial advantages over the natural pyrethrin insecticides; and that the synthetic pyrethrin esters developed by appellants have already formed the basis for extensive commercial production and use.

There is also in the record a publication from the Journal of the Chemical Society of London indicating that a research team of competent chemists sought to synthesize cyclopentenolones of the type claimed and failed to do so.

We are convinced after a review of the record herein that, as appellants contend, there is a considerable degree of unpredictability in the insecticide field with homologs, isomers and analogs of known effective insecticides having proven ineffective as insecticides. In view of this, and the other factors previously discussed, we conclude that all the compounds of the subgroup in Markush claim 48 are inventive and patentable over the prior art of record, albeit they include isomers and homologs of the compounds shown in LaForge et al. Considering the history of the art at the time of the invention, the occasion for the invention, and its success, we think such a conclusion unavoidable. See *In re McKenna et al.*, 40 C.C.P.A. (Patents) 937, 203 F.2d 717, 97 USPQ 348 . *In re Bowden et al.*, 37 C.C.P.A. (Patents) 1201, 183 F.2d 115, 86 USPQ 419 .

We note that the examiner allowed in claim 18 the allyl species of cyclopentenolone, which is 2-allyl-4-hydroxy-3-methyl-2-cyclopenten-1-one, the first compound recited in claim 48. It appears to us that this species is a homolog of the cinerolone moiety shown in LaForge et al. In the former, R in the 2 position is the radical C<sub>3</sub>H<sub>5</sub> having a double bond; in the latter, it is the 2-butetyl radical C<sub>4</sub>H<sub>7</sub> having a double bond.

[12] Allowability of an appealed claim is not controlled by the fact that similar claims have been allowed in the Patent Office, since an appealed claim must be patentable in its own right in the opinion of this court. However, similar claims allowed by the Patent Office tribunals furnish evidence of what features those tribunals regard as patentable, and we think it proper, and sometimes necessary, to consider allowed claims in order to fully determine the views of the board and the examiner. *In re Bisley*, 39 C.C.P.A. (Patents) 982, 197 F.2d 355, 94 USPQ 80 , and cases cited therein.

We think the examiner's allowance of the specific compound of claim 18 indicates recognition of the presence of invention therein, notwithstanding the disclosure of a homolog in the prior art. We think the Patent Office tribunals erred in not extending similar recognition of invention in the other compounds of claim 48, which are analogous to the allyl species allowed in claim 18.

In view of the foregoing, the rejection of claim 48 will not be sustained.

Accordingly, the rejection of claim 48 is hereby *reversed* and the rejection of claims 17, 46 and 47 is *affirmed*.

**In re Schechter and LaForge, 98 USPQ 144 (CCPA 1953)**

**Footnotes**

**In re Schechter and LaForge, 98 USPQ 144 (CCPA 1953) \ Footnotes**

**Footnote 1.** "The specification shall conclude with one or more claims *particularly pointing out and distinctly claiming* the subject matter which the applicant regards as his invention."

**Footnote 2.** The compound apparently referred to here is the "natural" scission product cinerolone, 2(2-butenyl)-4-hydroxy-3-methyl-2-cyclopenten-1-one, which is disclosed in that reference.

**Footnote 3.** Quoting with approval from Ex parte Burke, 1934 C.D. 5 [ 21 USPQ 399 ].

**Footnote 4.** In re Hass et al., *supra*.

**Footnote 5.** In re Norris, 37 C.C.P.A. (Patents) 876, 179 F.2d 970, 84 USPQ 458 .

**- End of Case -  
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